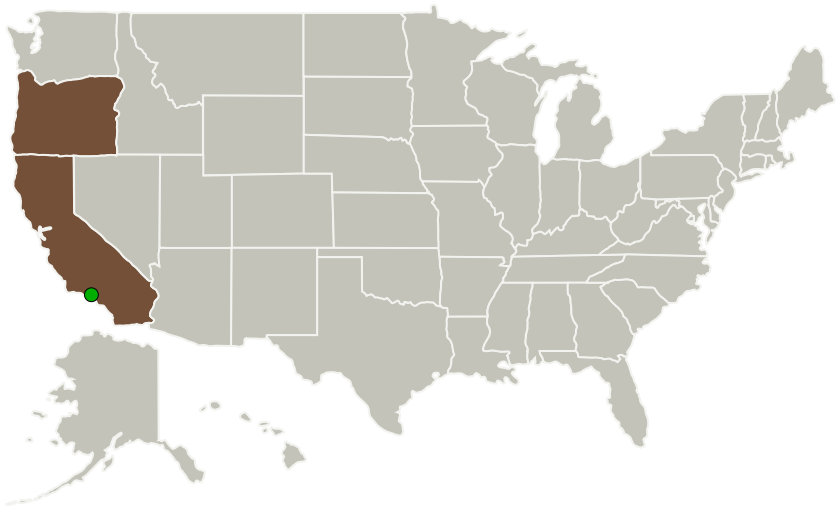
Nano-Particle Scandate Cathode for Space Communications, Phase I

Completed Technology Project (2010 - 2010)

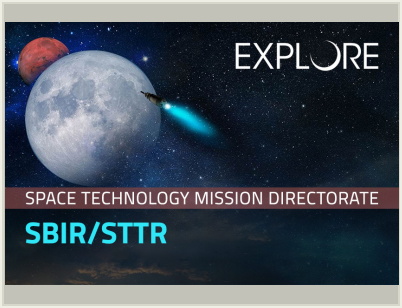
Project Introduction

We propose an improved cathode based on our novel theory of the role of scandium oxide in enhancing emission in tungsten impregnate cathodes. Recent results have demonstrated the efficacy of nano-particle scandium oxide, but a detailed theory on mechanism has been lacking. Our theory explains published data and point to an optimized cathode which we here propose to build and test at our facility. The cathode is the performance limiting component in high frequency linear beam amplifiers such as traveling wave tubes and klystrons. Bandwidth, data rates, numbers of channels, frequency and output power requirements are going up. The performance of linear beam amplifiers is acutely limited by the cathode limitations. Scandate cathodes offer a way to increase emission from current limits of about 10 A/cm2 to about 50 A/cm2.

Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
e-beam, Inc.	Lead Organization	Industry Veteran-Owned Small Business (VOSB)	Beaverton, Oregon
Jet Propulsion Laboratory(JPL)	Supporting Organization	NASA Center	Pasadena, California



Nano-Particle Scandate Cathode for Space Communications, Phase I

Table of Contents

Nano-Particle Scandate Cathode for Space Communications, Phase I

Completed Technology Project (2010 - 2010)

Primary U.S. Work Locations	
California	Oregon

Project Transitions

January 2010: Project Start

July 2010: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/140556)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

e-beam, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

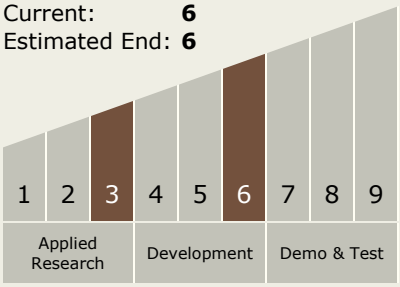
Carlos Torrez

Principal Investigator:

Bernard K Vancil

Technology Maturity (TRL)

Start: **3**
Current: **6**
Estimated End: **6**



Nano-Particle Scandate Cathode for Space Communications, Phase I

Completed Technology Project (2010 - 2010)

Technology Areas

Primary:

- TX05 Communications, Navigation, and Orbital Debris Tracking and Characterization Systems
  - TX05.2 Radio Frequency
    - TX05.2.2 Power-Efficiency

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System